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Radar Transcriptions from AN/FPS-95 to Madre OTH Radar

[Unclassified Title]

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

(U) Magnetic tape recordings of the AN/FPS-95 OTH radar receiver output have been converted on a general purpose computer to a form suitable for playback on the MADRE radar signal processor. These playbacks demonstrate the excellent detection capability of the AN/FPS-95 when used in conjunction with the MADRE processor and displays. The usefulness of clutter filtering, doppler shifting, and data word bit selection are demonstrated.

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RADAR TRANSCRIPTIONS FROM AN/FPS-95 TO MADRE OTH RADAR (U)

I. INTRODUCTION (U)

(U) The AN/FPS-95 was designed to become an operational radar for OTH detection and tracking of aircraft, while the MADRE radar was designed to perform research. Considerable data and background information have been accumulated with the MADRE radar. Data processors and displays of the two radars are radically different. It therefore became desirable to process the raw signals from the FPS-95 on the MADRE processor in order to determine the relative performance of the two radars as well as compare the two signal processors and display systems.

(U) In effect, a third processor was utilized by programming a Xerox Sigma 5 computer; this work has been reported elsewhere (Ref. 1).

II. TAPE CONVERSIONS (U)

(U) The FPS-95 and MADRE radars both have the capability to record the receiver outputs on magnetic tape. However, to be able to play back an FPS-95 recording on the MADRE processor it is necessary to adjust for the following differences:

1. Nine vs seven track recording
2. Number of range bins
3. Tape header length and composition
4. Number of data words per record
5. Number of data channels
6. Number of bits per data word

(U) These adjustments are accomplished on a CDC-3800 general purpose computer using the program listed in Appendix I. A very brief description of this program follows.

(U) Data cards containing the range bins desired and other processing parameters are read. The first record from FPS-95 tape is read (Subroutine RECORDIN) and the next record is started to conserve computer time. Meanwhile the first header is interpreted (Subroutines HEADER1 and HEADER2). Data from the header is used to form a MADRE header (Subroutine FORMHDS) and set additional parameters (Subroutine SELECTER) such as PRF code, number of bins, and record size. The

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program is then ready to transfer data words. This is done in three nested loops arranged to handle PRF intervals, range bins, and channels with channels being the inner loop. On completion of each PRF interval, if the input data from the last tape record have been exhausted, the next record (Subroutine NEXTIN) is read and processing continues. When the proper output record size for MADRE is reached (as determined by loop limits), an output record is made (Subroutine TAPE) and the process repeats. Throughout this process, an accurate account of time is kept by counting the PRF intervals and dividing by the PRF. This is updated from input tape headers to insure synchronism.

III. DATA PROCESSING DURING CONVERSION (U)

(U) During the tape conversion already described it is not too difficult to do some operations on the data to supplement the MADRE signal processor. Experiments were made with two processes - clutter filtering and doppler shifting.

(U) Clutter filtering was a logical experiment because the FPS-95 signal processor incorporates this feature while the MADRE clutter filter is essentially inoperative. Thus by doing the clutter filtering during preparation of tapes, one obtains a more direct comparison of the two signal processors. The program used provides a Butterworth filter (Subroutine BUTTR) in which the number of poles, notch width, and gain can be varied. Selection of the gain was best determined by a short preliminary computer run to observe the signal level generated. The gain was automatically adjusted downward from a high level until an acceptable criterion was reached.

(U) The MADRE signal processor eliminates the very low doppler frequencies. Doppler shifting by an amount equal to the PRF divided by four is easy to do during transcription and can be useful in examining the backscatter return and slow moving targets.

IV. TEST PROGRAM (U)

(U) In the process of correcting the program it was observed that certain errors cause a skewing of the data which produced a smearing of the normal radar displays. Depending on the degree, this type of error could be imperceptible from the displays. For this reason it was imperative that a test program be developed (see Appendix II). This program generates an artificial record of data having an easily recognizable pattern. Contained in the data word are numbers for the channel, range bin and pulse interval. The data are transcribed and then printed for visual inspection of individual data words.

V. PROBLEMS ENCOUNTERED DURING PLAYBACK (U)

(U) The FPS-95 has only one data sample rate, namely, 4000 Hz. The basic sample rate for the MADRE processor is 3960 Hz; however, this effectively changes whenever it is instructed to process a non-standard PRF. Because of this difference it is not possible to have the range and doppler cursors both reading correctly at the same time. The range will be correct whenever the effective sample rates match and the doppler readings will be correct when the original PRF is used. Actually, rather than the sample rate changing with the actual PRF instruction, the MADRE processor changes scaling for the various strobes and digital readout. However, for the purpose of explanation this can be regarded as a change in the effective sample rate.

(U) Scaling is further compounded because the first range bin recorded on FPS-95 tape does not always match the first range bin expected on MADRE tape. One additional correction is required because the FPS-95 samples did not occur at the center of the pulse with the exception of the 0.25-ms pulse length. The following formula has been evolved to account for the above:

FPS-95 True Range = (RB offset in nmi) + (MADRE RB No. - 1) x (FPS-95 RB width) - (Pulse length correction)

The FPS-95 RB width is 20.24 nmi and the pulse length correction is shown below.

Pulse Length (ms)	Correction (nmi)	First RB Recorded
0.25	0	2
0.50	-11	3
0.75	-21	4
1.0	-31	5
1.5	-71	5
2.0	-91	5
3.0	-131	5

(In the FPS-95 displays this correction was made automatically.)

(U) The MADRE strobe readout can be corrected according to the following formula:

Corrected MADRE Range Readout = [(Actual MADRE Readout) x (MESR ÷ FSR)] + (RB Offset in nmi) - (Pulse Length Correction)

where MESR = MADRE Effective Sample Rate
= 3960 x Actual MADRE PRF ÷ Original FPS-95 PRF
FSR = FPS-95 Sample Rate = 4000

(U) In measuring time on a MADRE doppler vs time display, the time scale is corrected as follows:

Corrected MADRE Time Readout = Actual MADRE Readout x Actual MADRE PRF ÷ Original FPS-95 PRF

As an example, a tape was transcribed and played back so that the doppler readings would be correct. This then resulted in the range relationships shown in Table I.

VI. RESULTS (U)

(S) An example of the results produced by this program has been previously reported in Ref. 2. Two additional missile observations have been made; one occurring on 14 Oct 1972 for Plesetsk at 0617 GMT. The observed signature is shown in Figs. 1 and 2. This is most likely an ionospherically refracted return from the burning missile for the following reasons:

1. The signal commenced 3½ minutes after reported launch time and lasted 40 seconds. Thus the missile would reach altitudes under refracted illumination but be below the ionosphere.

2. The measured slant range is 327 nmi beyond the launch point. Ionospheric perturbations are usually observed at double the range of ionospheric missile penetration.

3. The target changed range at an average rate of 8936 knots.

4. The signal is discrete in range for its entire duration.

(S) This detection would undoubtedly have continued beyond 40 seconds were it not for the fact that it disappeared into the transmitter pulse at the end of the PRF interval. Also the beginning of the interval was obscured by heavy clutter returns.

(S) Another example is shown in Figures 3, 4, and 5. This missile was reported launched at 0736 GMT from the Northern Fleet Missile Test Center (NFMTC). A signature at 1430 nmi (70 nmi beyond launch slant range) commenced 4 min. 37 sec. after launch and lasted 1 min. 29 sec. (Figs 3 and 4) This was immediately followed by another signature at 2357 nmi (1000 mi beyond launch) commencing 6 min. after launch and lasting 1 min. 54 sec. (Fig. 5) It is entirely possible that more detailed analysis would reveal the significance of these signatures.

VII. CONCLUSIONS (U)

TABLE I - RANGE BIN CORRELATION TABLE
FOR THE FOLLOWING CONDITIONS:

FPS-95 PRF = 40 Pulse Length = 1 ms First RB on FPS-95
tape transcribed to MADRE-type tape = 4th MADRE processor
PRF = 40.00

FPS-95		MADRE		
RB No.	Computed Range	RB No.	Computed and Displayed Range	Transcription True Range
1*	0			
2*	20.24			
3*	40.5			
4*	60.7			
5	81.0			
6	101.2	1	0	
7	121.4	2	23	
8+	141.7	3	46	111
9	161.9	4	69	131
10	182.2	5	92	151
11	202.4	6	115	171
12	222.6	7	138	192
93	1862.1	88	2001	1831
100	2024			

True range = (MRB - 1) x(20.24) + 101.2 - 31
where MRB = MADRE range bin number

Corrected range = (MADRE readout x 0.88) + 101.2 - 31

* Not available

\+ First range bin transcribed

(U) Tapes played back on the MADRE system have served to emphasize the weakness in the FPS-95 display system. Despite the fact that the MADRE processor has less dynamic range (12 bits vs 16), it has consistently been possible to make detections on an initial playback that were missed in either real time or playback on the FPS-95 system.

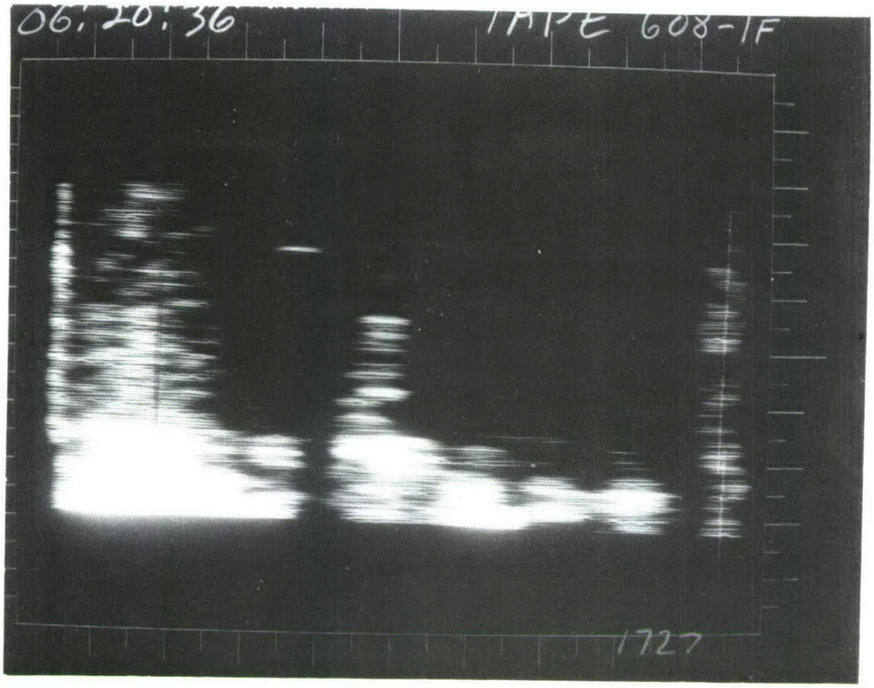
(S) Five periods of observation have been converted to date. Four of these cover missile launches and in each case evidence of the missile was detected. Every tape produced numerous aircraft tracks in areas of suitable radar coverage.

(U) This program has served as a useful medium for investigating the effectiveness of various signal processing procedures such as digital clutter filtering, doppler frequency shifting, and selection of data word bits (when the data word size exceeded the processor capability). A dynamic selection of data word bits on a range-bin basis promises to yield further improvement and may be attempted in the future.

REFERENCES

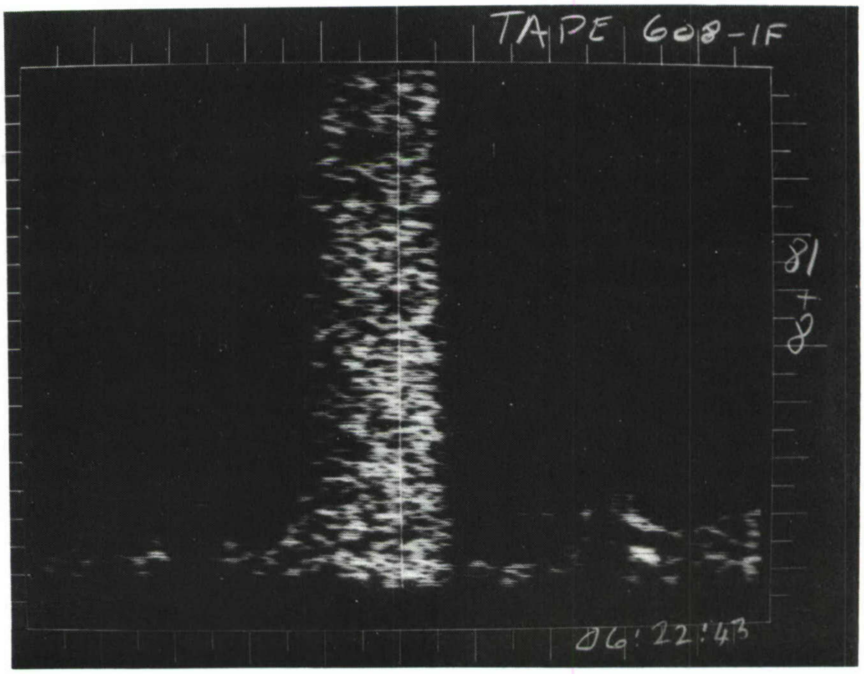
1. "A Computer Program for Radar Signal Processing," (U) J. M. Hudnall, report in preparation.

2. "MADRE Analysis of Observational Data," (U) F. H. Utley, F. Boyd, C. Howe, G. Skaggs and B. Navid, Proceedings of the OHD Technical Review Meeting of 2-3 May 1973, Vol. V, p. 121 (SECRET).



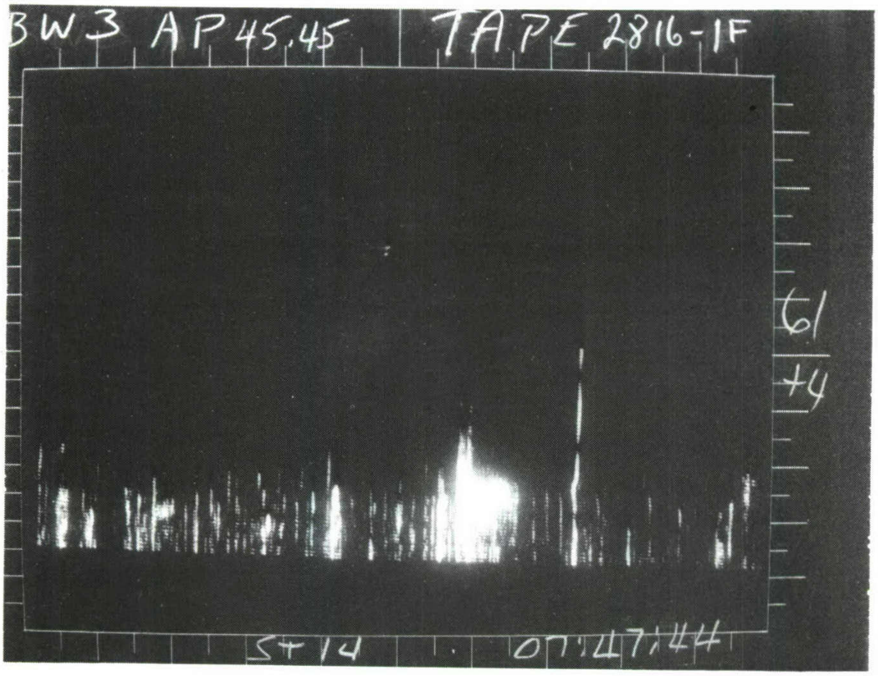
(S) Fig. 1 - Range vs doppler display for 10/14/72 at 06:20:36 GMT. Range strobe is centered on missile signature at 1798 nmi.

[redacted]

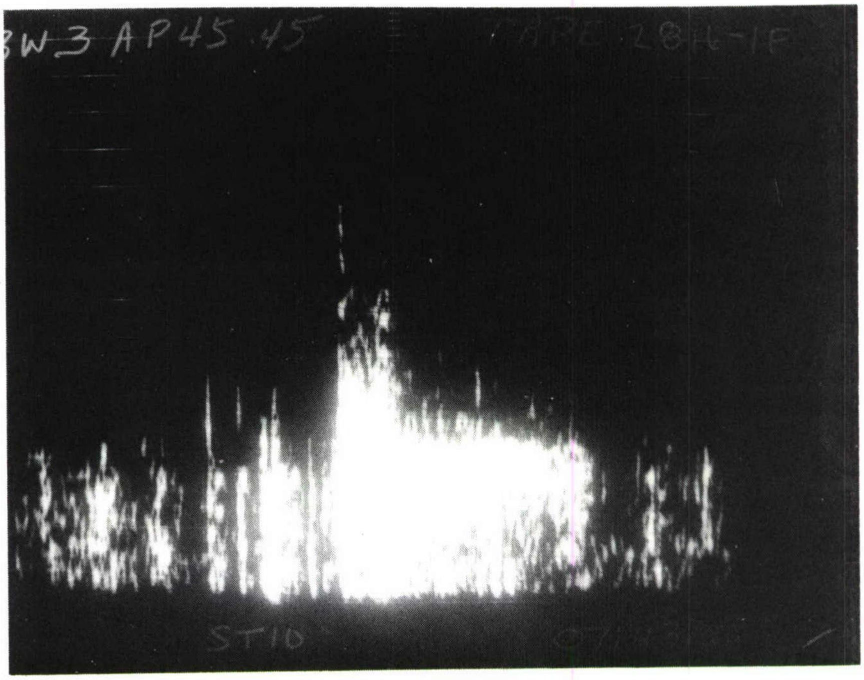


(S) Fig. 2 - Time vs doppler display for 10/14/72 showing 248 seconds ending at 06:22:43 GMT. The range bins selected cover 1690 to 1831 nmi and the time strobe is at 16:20:36 GMT.

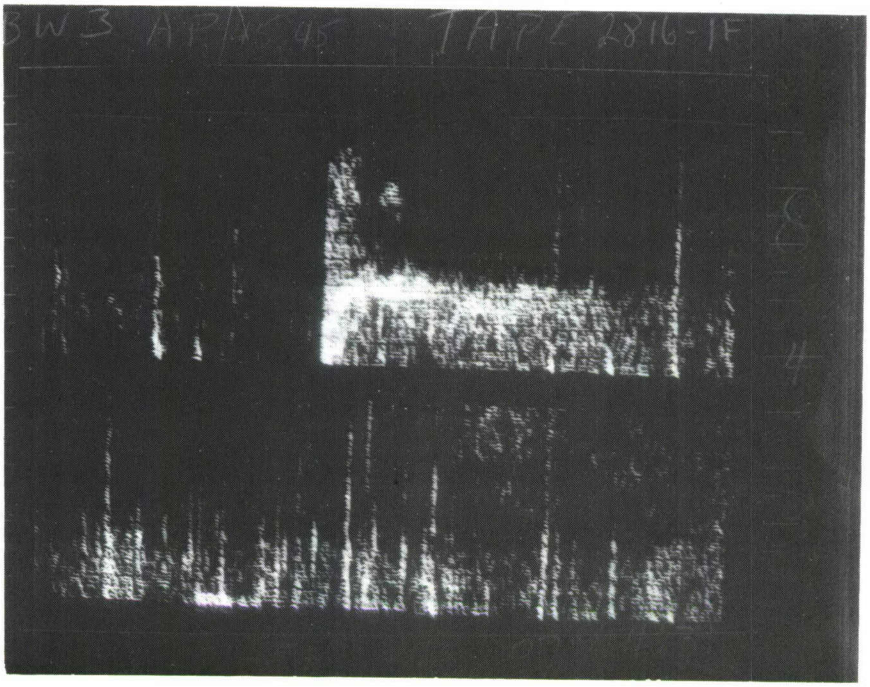
[redacted]



(S) Fig. 3 - Time vs doppler display for 10/31/72 showing 16 minutes and 30 seconds ending at 07:47:44 GMT. The range bins selected cover 1285 to 1366 nmi and the missile signature can be seen about one-third of the distance from the right-hand side.



(S) Fig. 4 - Same as Fig. 3 except for expanded time scale (4 min. shown). Missile signature occurs between 07:40:37 and 07:42:06 GMT.



(S) Fig. 5 - Time vs doppler display for 10/31/72 showing 240 seconds ending at 07:44:31 GMT. The range bins selected for the upper trace cover 2237 to 2318 nmi.

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APPENDIX I - TAPE CONVERSION PROGRAM LISTING (U)

```
      PROGRAM FPS95REC
C CONVERTS FPS-95 REC TAPE TO MADRE TAPE
C VERSION THREE, MODIFIED 3/10/73, 3/20/73
C FOR INPUT TAPE USE EQUIP,9=M9
C FOR OUTPUT TAPE USE EQUIP,20=**,HY,DA
C FIRST DATA CARD, COL 1-59  SERIAL NUMBER OF ORIGINAL TAPE
C SECOND DATA CARD, COL 1-29  FIRST     RANGE BIN  TO BE PROCESSED
C                   COL 4-69  NUMBER OF RECORDS TO BE PRINTED
C                   COL 8-119 NUMBER OF RECORDS TO BE PROCESSED
C THIRD DATA CARD, COL 1-10 F10.3 NO. POLES
C                  COL 11-20 F10.3 NOTCH RATIO
C                  COL 21-30 F10.3 CFGAIN
C ARITHMETIC INCLUDED FOR SELECTION OF LSB OF DATA                        LSB
C  CHANNEL 1 IS CLUTTER FILTERED, CHANNEL 3 IS FREQUENCY SHIFTED
C
      COMMON /FILTER/ NPOLES, RATIO, CFGAIN, NBIN                         FILTER
      COMMON /DATA/ ICDC(7000)
      COMMON /IND REC/ LHEADER(15), LDATA(2216)
      COMMON /HEADERL/ BLANK1, IPRFCODE, ISRATE, IAR, INCHAN, INFILTER,
     1  IAB, IAPRF, NUMBER6, ITIME6, FREQ, IRCOUNT, IDC , IAPRFF
      COMMON /USE/ ISIZE, IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1  M, MSIZE, INITIME, MDROP, PRF, MRCVRWRD, LENHEADS, MSTART,
     2  NPRINT, NREC
      COMMON /SWITCHES/ IEOTSW, IEOT9T                                     A1490
      COMMON /11   / IOVER (100), IUNDER (100)                            LSB
      DATA(K4=1)                                                          FSHIFT
C ***************************************************************************
C
C START EXECUTION
C FIRST RECORD
   22 CALL RECORD IN
   10 ITIME6 = INITIME + INTCOUNT/ PRF
C LOOP ON PRF INTERVAL TO COMPLETE ONE OUTPUT RECORD
```


[redacted]

[redacted]

```
      DO 16 INT NO = 1, IPERREC
         INTCOUNT = INTCOUNT + 1
C         LJOP ON BINS TO COMPLETE ONEINTERVAL
         DO 14 IBINNO = 1, IBINMAX
C           LOOP ON CHANNELS
            IBINWRD = 1
C              'L' IS WORD NUMBER WITHIN CURRENT DATA RECORD
               L = IBINWRD + NCPB * IBINNO - NCPB + INTNO * IBINMAX
     1           * NCPB - IBINMAX * NCPB
               LDATA(L)=IFILTER(ICDC(M+LENHEADS),IBINNO)                  FILTER
               IF (LDATA(L   ) .GT. 403 777B) GO TO 34                    LSB
               IF (LDATA(L   ) .LT. 374 000B) LDATA(L   ) = 374 000B      LSB
               GO TO 36                                                   LSB
   34          LDATA(L   ) = 403 777B                                     LSB
   36          LDATA(L   ) = LDATA(L   ) - 374 000B                       LSB
C              CHANNEL TWO
C              FREQ. SHIFT PRF/4, NEXT CHAN.
C              DC BIAS UNCORRECTED
               GO TO (1,2,3,4) K4
    1          LDATA(L+1) = ICDC(M+1+LENHEADS)
               GO TO 20
    2          LDATA(L+1) = ICDC(M  +LENHEADS)
               GO TO 20
    3          LDATA(L+1) =-ICDC(M+1+LENHEADS) + 1 000 000B
               GO TO 20
    4          LDATA(L+1) =-ICDC(M  +LENHEADS) + 1 000 000B
   20          M = M + 3
               IF (LDATA(L+1) .GT. 403 777B) GO TO 24                     LSB
               IF (LDATA(L+1) .LT. 374 000B) LDATA(L+1) = 374 000B        LSB
               GO TO 26                                                   LSB
   24          LDATA(L+1) = 403 777B                                      LSB
               IUNDER(IBINNO) = IUNDER(IBINNO) + 1                        LSB
   26          LDATA(L+1) = LDATA(L+1) - 374 000B                         LSB
C           END OF CHANNEL LOOP
   14    _CONTINUE
```


[redacted]

```
C         END OF BIN LOOP, ONE INTERVAL COMPLETED
                K4 = K4 + 1                                         FSHIFT
                IF(K4 .GT. 4) K4=1                                  FSHIFT
          M = M + MDROP * 3
C               CHECK FOR EXHAUSTION OF INPUT DATA                   4710
   16 IF (M .GE. MSIZE) CALL NEXT IN
C       END  LOOP ON NUMBER OF INTERVALS PER RECORD, RECORD COMPLETED
   18 CALL TAPE
      IF (IEOTSW .EQ. 1) CALL FINIS(3)
      GO TO 10
      END
      SUBROUTINE RECORD IN
C PREPARES FOR INITIAL LOOP
      COMMON /KOPFER/ LIST (400)
      DIMENSION IHEADER(200), JHEADER(200)
      EQUIVALENCE (IHEADER (1), LIST (1)), (JHEADER (1), LIST (201))
      EQUIVALENCE (JHEADER (10), JPRF)
      EQUIVALENCE (JHEADER (37), JTIMEDAY)
      EQUIVALENCE (JHEADER (52), JFHDRF)
      EQUIVALENCE (JHEADER (53), JNEWTAPE)
      EQUIVALENCE (JHEADER (57), NRECST)
      COMMON /DATA/ ICDC(7000)
      COMMON /USE/ ISIZE, IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1  M, MSIZE, INITIME, MDROP, PRF, MRCVRWRD, LENHEADS, MSTART,
     2  NPRINT, NREC
      COMMON /SWITCHES/ IEOTSW, IEOT9T
      COMMON /FILTER/ NPOLES, RATIO, CFGAIN, NBIN                   FILTER
C
C START EXECUTION
C       FIRST DATA CARD
      READ 50, M
   50 FORMAT (I5)
      PRINT 51, M
   51 FORMAT (* ORIGINAL TAPE SERIAL NUMBER IS -*, I5)
C       SECOND DATA CARD
      READ 53, MSTART,NPRINT,NREC
```

```
   53 FORMAT (I2,X,I3,X,I4)
      PRINT 54, MSTART
   54 FORMAT (/,* TAPE REFORMATTED STARTING WITH RANGE BIN*,I3)
C     THIRD DATA CARD
      READ 55, NPOLES, RATIO, CFGAIN
   55 FORMAT (3F10.3)
      PRINT 56, NPOLES,RATIO, CFGAIN
   56 FORMAT (* FILTER CONSTANTS - NO. POLES = * F10.3, 5X *NOTCH RATIO
     I = * F10.3, 5X *CFGAIN = * F10.3)
C     PRINT PAGE HEADING
C     PRINT 8980
C8980 FORMAT( 118X,*RECORD NUMBERS*/ 118X, *FROM START OF* / 101X, *VOIC
C    1E  NO. DATA  --------------* / 102X, *CUE      WORDS    INTEGR   TAP
C    2E*)
C READ FIRST RECORD
      CALL NINEGO
C PROCESS FIRST RECORD
      CALL READNINE
      CALL HEADER1
C JFHDRF IS TRUE WHEN FULL HEADER FOLLOWS OR JNEWTAPE
      IF (.NOT. JFHDRF .AND. .NOT. JNEWTAPE) GO TO 20
                 LENHEADS = 74
      CALL HEADER2
      CALL SELECTER
      NBIN = IBINMAX                                                  FILTER
C SET INITIAL VALUE OF INPUT WORD COUNTER, M. USE IN PHASE SUM DATA
   10 M = 1 + (MSTART-1) * 3
C     MSIZE = NO. RECEIVER WORDS
      MSIZE =MRCVRWRD
      RETURN
   20 LENHEADS = 4
      GO TO 10
C     END OF RECORD IN
C ***********************************************************************
             ENTRY NEXT IN
C READS ONE INPUT RECORD, CHECKS E OF F, REPACKS, PRINTS HEADER, SETS M
```

TEMP

```
      IF (NRECST.GT.NREC) CALL FINIS (1)
      LPRF = JPRF
      CALL READNINE
      IF (IEOT9T .NE. 0) CALL FINIS(6)
      CALL HEADER1
C JFHDRF IS TRUE WHEN FULL HEADER FOLLOWS OR JNEWTAPE
      IF (.NOT. JFHDRF .AND. .NOT. JNEWTAPE) GO TO 30
                    LENHEADS = 74
      CALL HEADER2
C     RESET TIME TO AGREE WITH HEADER
      INITIME = JTIMEDAY
      INTCOUNT = 0
C     CRITICAL PARAMETER TESTS FOLLOW
      IF (JPRF .NE. LPRF) CALL SELECTER
   40 M = 1 + (MSTART-1) * 3
C     MSIZE = NO. RECEIVER WORDS
      MSIZE =MRCVRWRD
      RETURN
   30 LENHEADS = 4
      GO TO 40
      END
      SUBROUTINE HEADER1
      COMMON /KOPFER/ LIST (400)
      DIMENSION IHEADER(200), JHEADER(200)
      EQUIVALENCE (IHEADER (1), LIST (1)), (JHEADER (1), LIST (201))
C FULL EQUIVALENCE STATEMENTS OMITTED TO ACHIEVE BREVITY
      EQUIVALENCE (JHEADER (51), JEOT)
      LOGICAL JEOT
      EQUIVALENCE (JHEADER (52), JFHDRF)
      LOGICAL JFHDRF
      EQUIVALENCE (JHEADER (53), JNEWTAPE)
      LOGICAL JNEWTAPE
      EQUIVALENCE (JHEADER (54), JRNSTII)
C VOICE CUE SWITCH--SET IF ACTIVE.  JVOICEQ LOGICAL
      EQUIVALENCE (JHEADER (55), JVOICEQ)
      LOGICAL JVOICEQ
```

[redacted]

```
C NUMBER OF RECEIVER WORDS IN THIS RECORD,
      EQUIVALENCE (JHEADER (56), NRCVRWRD)
C RECORD NUMBER OF CURRENT RECORD RELATIVE TO START OF TAPE
      EQUIVALENCE (JHEADER (57), NRECST)
      COMMON /DATA/ ICDC(7000)
      COMMON /USE/ ISIZE, IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1  M, MSIZE, INITIME, MDROP, PRF, MRCVRWRD, LENHEADS, MSTART,
     2  NPRINT, NREC
C DISSECT WORD ONE AND SET LOGICALS
      CALL DYSSECT
C JEOT = END OF RECORDS
      JEOT =.FALSE.
      IF (LIST(51)                  .NE. 0) JEOT =.TRUE.
C JNEWTAPE = TAPE CONTINUATION AT BREAK IN INTEGRATION INTERVAL
      JFHDRF = .FALSE.
      IF    (      LIST(52)                           .NE. 0) JFHDRF = .TRUE.
      JNEWTAPE = .FALSE.
      IF            (LIST(53)                     .NE. 0) JNEWTAPE = .TRUE.
C JRNSTII = RECORD NO. REL. TO START OF INTEGRATION INTERVAL
      JRNSTII = LIST(54)
C END WORD ONE DISSECTION
      IF (JEOT) CALL FINIS(4)
C 980 IF (JNEWTAPE) PRINT 2
C   2 FORMAT(* THIS IS A CONTINUED TAPE WITH BREAK DURING INTEGRATION IN
C    1TERVAL*)
  980 CONTINUE
C EQUATE REMAINING WORDS OF HEADER (PART 1)
      JVOICE =    ICDC(2)
      NRCVRWRD =  ICDC(3)
      NRECST   =  ICDC(4)
      IRCHECK = NRECST
      MVOICEQ = 4HOFF
      IF (JVOICEQ        ) MVOICEQ  = 4HON
C COMPUTE ONE'S COMPLEMENT OF NRCVRWRD
```


[redacted]

```
C NECESSARY CORRECTIONS FOR COMPLEMENTARY ARITHMETIC IS -2+1
      MRCVRWRD =777776B - NRCVRWRD
C     HEADER 1 OUTPUT IF NEEDED
C     PRINT 8980, (MVOICEQ,MRCVRWRD, JRNSTII,  NRECST)
C8980 FORMAT (102X, A4, 4X, I4, 2X, I6, 2X, I6)
C     FOR SAKE OF UNIFORMITY 2ND HALF OF LIST SHOULD HAVE BEEN USED -
C     APPLIES TO DYSSECT ALSO
      RETURN                                                           21500
      END                                                              21600
      SUBROUTINE HEADER2
      COMMON /KOPFER/ LIST (400)
      DIMENSION IHEADER(200), JHEADER(200)
      EQUIVALENCE (IHEADER (1), LIST (1)), (JHEADER (1), LIST (201))
C PRF--IPRF 1-160, 2-80, 3-53.3, 4-40, 5-10.  ALSO, PRF IS REAL.
      EQUIVALENCE (JHEADER (10), JPRF)
      EQUIVALENCE (JHEADER (11), PRFHDRRC)
C TIME OF DAY, DAY OF YEAR
      EQUIVALENCE (JHEADER (37), JTIMEDAY)
      EQUIVALENCE (JHEADER (38), JDAYYEAR)
      COMMON /DATA/ ICDC(7000)
      COMMON /USE/ ISIZE, IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1 M, MSIZE, INITIME, MDROP, PRF, MRCVRWRD, LENHEADS, MSTART,
     2 NPRINT, NREC
C                                                                        220
C PRF LEGEND                                                             230
      DIMENSION MPRF(5)                                                  240
      DATA(MPRF =4H 160, 4H  80, 4H53.3, 4H  40, 4H  10)                 250
      DIMENSION MTIME (3), MDAY (2)                                      590
C                                                                        570
C TIME OF DAY, DAY OF YEAR PRINTOUT LIST                                 580
C LIST TO TRANSLATE FROM DAY OF YEAR TO MONTH OF YEAR, DAY OF MONTH      600
C   LEAP YEAR ALTERNATIVE AVAILABLE                                      610
      DIMENSION LMDO (13), LMD (12), LMDOLY (13), LMDLY (12)             620
      EQUIVALENCE (LMDO (2), LMD (1)), (LMDOLY (2), LMDLY (1))           630
      DATA(LMDO =0, 31, 59, 90, 120, 151, 181, 212, 243, 273, 304, 334,  640
     1          365)                                                     650
```

[redacted]

```
      DATA(LMDOLY =0, 31, 60, 91, 121, 152, 182, 213, 244, 274, 305,          670
     1             335, 366)                                                   680
C************************************************************************
      CALL DSSCT2
 1000 MTIME (1) = JTIMEDAY / 3600                                    HR
      MTIME (2) = (JTIMEDAY - MTIME (1) * 3600) / 60                 MIN
      MTIME (3) = JTIMEDAY - MTIME (1) * 3600 - MTIME (2) * 60       SEC
      DO 1020  I = 1, 12
C     IF (JDAYYEAR .LE. LMD (I)) GO TO 1040
      IF (JDAYYEAR .LE. LMDLY(I))GO TO 1040
 1020 CONTINUE                                                                 980
      PRINT 1021                                                               780
 1021 FORMAT (* ERROR - DAY TOO LARGE*)                                        781
 1040 MDAY (1) = I                                                            1000
C     MDAY (2) = JDAYYEAR - LMDO (I)
      MDAY (2) = JDAYYEAR - LMDOLY(I)
      PRINT 9120, (MTIME (I), I = 1, 3), (MDAY (J), J = 1, 2),
     1  MPRF(JPRF), MSIZE
 9120 FORMAT (8X,*TIME*,I3,*9*,I2,*9*,I2,*   DAY *,I2,*/*,I2,
     A  *   PRF *, A4, *    MSIZE *, I5)
      END
      SUBROUTINE SELECTER
      COMMON /KOPFER/ LIST (400)
      DIMENSION IHEADER(200), JHEADER(200)
      EQUIVALENCE (IHEADER (1), LIST (1)), (JHEADER (1), LIST (201))
      EQUIVALENCE (JHEADER (10), JPRF)
      COMMON /HEADERL/BLANK1, IPRFCODE, ISRATE, IAR, INCHAN, INFILTER,
     1 IAB,IAPRF   , NUMBER6,ITIME6, FREQ,   IRCOUNT, IDC, IAPRFF
      COMMON /USE  /ISIZE  , IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1 M,MSIZE,INITIME,MDROP,PRF,MRCVRWRD,LENHEADS,MSTART,NPRINT,NREC
      DIMENSION SIZE (21), JBINMAX(7), MDROPT(4)
      DATA (SIZE = 1750, 1740, 2150, 1920, 2100, 2170, 2200,
     1             2100, 2088, 2064, 2112, 2142, 2139, 2160,
     2             2100, 2088, 2064, 1920, 2016, 2046, 2160)
      DATA (JBINMAX = 350, 174, 86, 64, 42, 31, 20)
      DATA (MDROPT = 4, 6, 8, 10)
```


[redacted]

```
      INTEGER SIZE
C     NO. OF RANGE BINS DROPPED FROM INPUT DATA
      MDROP = MDROPT(JPRF)
      IF(MSTART .LE. MDROP) GO TO 9
      PRINT 3, MSTART
    3 FORMAT (* ERROR EXIT BECAUSE MSTART = * I2)
      CALL EXIT
    9 CONTINUE
C     SELECT PRF CODE
      IF (JPRF .EQ. 1) GO TO 10
      IF (JPRF .EQ. 2) GO TO 20
      IF (JPRF .EQ. 3) GO TO 30
      IF (JPRF .EQ. 4) GO TO 40
      PRINT 2, JPRF
    2 FORMAT (* ERROR EXIT BECAUSE PRF CODE = *, I2)
      CALL EXIT
C     IAPRF AND IAPRFF USED TO FORM AP FOR HEADER ONLY
   10 PRF=160.0      $ IPRFCODE=7  $ IAPRF=1750B                 $ GO TO 60
   20 PRF= 80.0      $ IPRFCODE=5  $ IAPRF= 764B                 $ GO TO 60
   30 PRF= 53.33333  $ IPRFCODE=4  $ IAPRF= 515B $ IAPRFF=5      $ GO TO 60
   40 PRF= 40.0      $ IPRFCODE=3  $ IAPRF=372B                  $ GO TO 60
   60 CONTINUE
      ISRATE = 4
      ICHAN = 2
C     SELECT NO. OF CHANNELS PER BIN(NCPB)
      NCPB = 3
C     SELECT NO. OF DATA WORDS PER RECORD(ISIZE)
      N = IPRFCODE + 7
      ISIZE = SIZE(N)
C     SELECT NO. OF BINS(IBINMAX)
      IBINMAX =JBINMAX(IPRFCODE)
      IF (ISRATE .EQ. 8)  IBINMAX = 2 * IBINMAX
C     COMPUTE NO OF PRF INTERVALS PER RECORD(IPERREC)
      IPERREC = ISIZE /(IBINMAX * NCPB)
      INITIME = JHEADER(37)
      PRINT 1,IPRFCODE,NCPB,N,ISIZE,IBINMAX,IPERREC, MDROP             TEMP
```

```
    1 FORMAT (* IPRFCODE= *,I1,* NCPB= *,I1,* N= *,I2,* ISIZE= *,I4,      TEMP
     I    * IBINMAX= *,I4,* IPERREC= *, I4, * MDROP = *, I4)              TEMP
      RETURN
      END
      SUBROUTINE BUTTR (NPOLE, RATIO, GAIN, NSTAG)
C COMPUTES SCALED DIFFERENCE EQUATION COEFFICIENTS FOR POLES OF
C   BUTTERWORTH FILTER
      COMMON /CO/ A(2,5), B(2,5)
      DIMENSION F(3,2), P(2), S(100)
      DATA (N = 100)
      DATA (PI = 3.14159265358979)
C START EXECUTION
  100 IF (NPOLE .GT. 10) NPOLE=10
      W = TANF (RATIO * PI)
      D = W * W
      NSTAG = NPOLE / 2
      NODD = NPOLE - 2 * NSTAG
      F = FLOAT (2 * NPOLE)
      IF (NODD .EQ. 0) GO TO 200
      A(1,1) = -1.0 $ A(2,1) = 0.0
      B(1,1) = (W - 1.0) / (W + 1.0) $ B(2,1) = 0.0
  200 IF (NSTAG .EQ. 0) GO TO 400
      DO 300 K = 1, NSTAG
      J = K + NODD
      G = FLOAT (2 * K + NPOLE - 1)
      C = 2.0 * W * COS (PI*G/F)
      A (1,J) = -2.0 $ A (2,J) = 1.0
      B(1,J) = -2.0 * (1.0 - D) / (1.0 + D - C)
      B(2,J) = (1.0 + D + C) / (1.0 + D - C)
  300 CONTINUE
  400 IF (NODD .EQ. 1) NSTAG = NSTAG + 1
      PRINT 9000, (A(1,I),A(2,I),B(1,I),B(2,I),I=1,NSTAG)
 9000 FORMAT (     * FILTER COEFFICIENTS*,/,5(2(5X,2(F10.5))/))
      GAIN = 1.0
      DO 500 K = 1, NSTAG
      GAIN = GAIN * (1.0 - A(1,K) + A(2,K)) / (1.0 - B(1,K) + B(2,K))
```

```
  500 CONTINUE
      PRINT 9020, GAIN
 9020 FORMAT (X,* PASSBAND GAIN = *,F10.2)
      RETURN
      END
      FUNCTION IFILTER (IDATA, IBIN)
      COMMON /FILTER/ NPOLES, RATIO, CFGAIN, NBINS
      DIMENSION DELAY(4,5,100)
      COMMON /11   / IOVER (100), IUNDER (100)
      COMMON /CO/ A(2,5), B(2,5)
      DATA (IFIRST = 1)
C
C START EXECUTION
      IF (IFIRST .NE. 1) GO TO 500
      CALL BUTTR (NPOLES, RATIO, GAIN, NSTAGES)
      DO 400 IB = 1, NBINS
      IOVER (IB) = 0
      IUNDER (IB) = 0
      DO 300 ISTAGE = 1, NSTAGES
      DO 200 K = 1, 4
      DELAY (K, ISTAGE, IB) = 0.0
  200 CONTINUE
  300 CONTINUE
  400 CONTINUE
      IFIRST = 0
  500 CONTINUE
      ID = IDATA - 400000B
      X = FLOAT (ID)
      DO 600 ISTAGE = 1, NSTAGES
      Y = + X
     1    + A (1, ISTAGE) * DELAY (1, ISTAGE, IBIN)
     2    + A (2, ISTAGE) * DELAY (2, ISTAGE, IBIN)
     3    - B (1, ISTAGE) * DELAY (3, ISTAGE, IBIN)
```

[redacted]

```
4      - B (2, ISTAGE) * DELAY (4, ISTAGE, IBIN)
      DELAY (4, ISTAGE, IBIN) = DELAY (3, ISTAGE, IBIN)
      DELAY (3, ISTAGE, IBIN) = Y
      DELAY (2, ISTAGE, IBIN) = DELAY (1, ISTAGE, IBIN)
      DELAY (1, ISTAGE, IBIN) = X
      X = Y
  600 CONTINUE
      Y = Y / GAIN * CFGAIN
      IFILTER = Y + 400000B
      IF (IFILTER .LE. 777777B) GO TO 700
      IFILTER = 777777B
      IOVER (IBIN) = IOVER (IBIN) + 1
      GO TO 800
  700 IF (IFILTER .GE. 0) GO TO 800
      IFILTER = 0
  800 CONTINUE
      RETURN
      END
      SUBROUTINE FINIS (ISTOPSW)
C     SUBROUTINE TO TERMINATE PROGRAM WITH ASSOCIATED OUTPUT
      COMMON /USE   /ISIZE   , IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1 M,MSIZE,INITIME,MDROP,NIN,MRCVRWRD,LENHEADS,MSTART,NPRINT,NREC
      COMMON /11    / IOVER (100), IUNDER (100)
C
      PRINT 102, IRCHECK
  102 FORMAT(* RECORD COUNT FROM START OF INPUT TAPE =* I8)
      PRINT 103
  103 FORMAT(* NO. TIMES SIG. EXCEEDS 18 BIT CAPACITY IN CHAN. 1 OR 12
     1BIT CAPACITY IN CHAN. 3*/
     2                  *        BIN NUMBER    CHAN. 1      CHAN. 3 *)
      DO 200 IBIN=1,IBINMAX
  200 PRINT 104, IBIN, IOVER(IBIN), IUNDER(IBIN)
  104 FORMAT (3I12)
C
      GO TO (10,20,30,40,50,60          ) ISTOPSW
C
```


[redacted]

```
   10 PRINT 105
  105 FORMAT (* TERMINATE ON RECORD  LIMIT*)
      ENDFILE 20
      CALL EXIT
C
   20 PRINT 106
  106 FORMAT (* TERMINATED ON CRITICAL PARAMETER CHANGE ON INPUT TAPE*)
      ENDFILE 20
      CALL EXIT
C
   30 PRINT 101
  101 FORMAT (* END OF OUTPUT TAPE REACHED*)
      CALL EXIT
C
   40 PRINT 1
    1 FORMAT (* END OF INPUT TAPE RECORD*)
      ENDFILE 20
      CALL EXIT
C
   60 PRINT 110
  110 FORMAT (* END OF INPUT TAPE REACHED*)
      ENDFILE 20
      CALL EXIT
C
C
   50 RETURN
      END
         IDENT      READNINE
         ENTRY      NINEGO                                                   2
         ENTRY      READNINE                                                 5
DATA     BLOCK                                                               6
         COMMON     WLISTOUT(7000)                                           7
SWITCHES BLOCK                                                               8
         COMMON     SW1,EOT9TR                                               9
* SUBROUTINE TO ESTABLISH MODE AND START READIN OF FIRST RECORD             14
NINEGO   OCT        0                                                       16
```

[redacted]

```
* ESTABLISH TAPE INPUT AS LOGICAL UNIT 9
ESTABIU  MODE      9,ESTABIU,RO,BIN,HY
* START FIRST RECORD READIN
READ1ST  READ      9,INCNTRL,*
* THEN EXIT
         SLJ       NINEGO
*
* SUBROUTINE TO MOVE / TRANSFORM INPUT LIST AND START NEXT READ
READNINE OCT       0
* STATUS CHECK
STATCHIN STATUS    9
         QJP,MI    STATCHIN
* CHECK FOR EOT ENCOUNTERED
         QLS       10
         QJP,PL    ESTLIN
         RXT       P1,Q
         STQ       EOT9TR
         SLJ       READNINE
* ESTABLISH LENGTH OF INPUT RECORD
ESTLIN   SUB       INCNTRL
         ARS       24
         STA       COUNTER
         ROP,-     PZ,A,B1
         RXT       PZ,B2
         RXT       P1,B3
         RXT       PZ,B4
         RXT       P1,B5
         XMIT,AUG  INPLIST,WLISTIN
* THEN START TO READ NEXT RECORD
         READ      9,INCNTRL,*
* REFORMAT LIST
REFLIST  RXT       PZ,B1
         RXT       PZ,B2
         ENI       36,3
         ENI       24,4
         ENI       12,5
```


[redacted]

```
                                                290
          ENI       0,6                         320
ALOOP     LDA       WLISTIN,1                   330
          STA       HOLD3                       340
          LDA       WLISTIN+1,1                 350
          STA       HOLD3+1                     360
          LDA       WLISTIN+2,1                 370
          STA       HOLD3+2                     380
          LBYT,A12,E6,CL  HOLD3,,3              390
          LBYT,A6,E6  HOLD3,,4                  400
          LBYT,A0,E6  HOLD3,,5                  410
          LBYT,Q12,E6,CL  HOLD3,,6              420
          LBYT,Q6,E6   HOLD3+1,,3               430
          LBYT,Q0,E6   HOLD3+1,,4               500
          DSTA       WLISTOUT,2                 440
          LBYT,A12,E6,CL  HOLD3+1,,5            450
          LBYT,A6,E6  HOLD3+1,,6                460
          LBYT,A0,E6  HOLD3+2,,3                470
          LBYT,Q12,E6,CL  HOLD3+2,,4            480
          LBYT,Q6,E6   HOLD3+2,,5               490
          LBYT,Q0,E6   HOLD3+2,,6               435
          DSTA      WLISTOUT+2,2                590
          INI       3,1                         600
          INI       4,2                         610
          LDA       COUNTER                     620
          INA       3                           630
          STA       COUNTER                     640
          AJP,MI    ALOOP                       676
          SLJ       READNINE                    700
COUNTER   BSS       1                           710
HOLD3     BSS       3                           715
INCNTRL   IOTR      INPLIST,5240                720
INPLIST   BSS       5240                        730
WLISTIN   BSS       5240                        800
          END                                   100
          IDENT     DSSCT2
          TITLE GET PRF (CODE), TIME, DAY       200
          ENTRY     DSSCT2
```

[redacted]

```
KOPFER   BLOCK    400                                             300
         COMMON   LIST(400)                                       400
DATA     BLOCK
         COMMON   ICDC(7000)                                      600
DSSCT2   OCT      0                                               700
* PRF                                                             800
         ENQ      1600B                                           900
         LDL      ICDC+5                                         1100
         ARS      7
         STA      LIST+209
* DAY
         LDA      ICDC+18                                        1500
         STA      LIST+237
* TIME                                                           1400
         LDA      ICDC+17
         STA      LIST+236
         SLJ      DSSCT2                                         1700
         END                                                     1800
         IDENT    DYSSECT
*SEPERATES INFO CONTAINED IN FIRST   WORD  OF HEADER (PART 1)
*ERROR IN DATA WORD COUNT WILL OCCUR IF BIT 1 IS SET
         ENTRY    DYSSECT
KOPFER   BLOCK    400
         COMMON   LIST
DATA     BLOCK
         COMMON   ICDC(7000)
ZERO     OCT      0
ONE      OCT      1
DYSSECT  OCT      0
         LDA      ICDC
         NBJP,CL  A,17,JUMP1         IF BIT 17 IS 1, GO TO JUMP1, CLEAR BIT
         XMIT     ZERO,LIST+50       EQUATE TO ZERO
```


[redacted]

[redacted]

```
         SLJ        JUMP2
JUMP1    XMIT       ONE,LIST+50          EQUATE TO ONE
JUMP2    NBJP,CL    A,15,JUMP3
         XMIT       ZERO,LIST+51
         SLJ        JUMP4
JUMP3    XMIT       ONE,LIST+51
JUMP4    NBJP,CL    A,14,JUMP5
         XMIT       ZERO,LIST+52
         SLJ        JUMP6
JUMP5    XMIT       ONE,LIST+52
JUMP6    STA        LIST+53
         SLJ        DYSSECT
         END
         IDENT      TAPE SUBROUTINE
*CHANGES FROM TEST  TAPE ARE CARD NOS.      181, 191
         ENTRY      TAPE                                                10
         EXT        FORMHDR
IND REC  BLOCK                                                          20
         COMMON     IHEADER(15),IDATA(2216)                             30
USE      BLOCK                                                          32
         COMMON     NWREC,IPERREC,INTCOUNT,MAXNBI,NCHANPB               34
SWITCHES BLOCK
         COMMON EOTSW
TAPE     OCT        0                                                   40
         BRTJ       FORMHDR                                             42
         ENI        ,1                                                  50
         ENI        36,2                                                60
         ENI        ,3                                                  70
HDRLOOP  LDA        IHEADER,3                                           80
         SBYT,A0,E12,RI  LIST,1,2                                       90
         INI        1,1                                                100
         ENI        36,2                                               110
         ISK        15,3                                               120
         SLJ        HDRLOOP                                            130
         ENI        3,1                                                140
         ENI        ,2                                                 150
```


[redacted]

```
         ENI          ,3                                                160
         LDA          NWREC                                             170
         SAU          DATALOOP+3                                        180
DATALOOP LDA          IDATA,3                                           190
         SBYT,A0,E12,RI  LIST,1,2      A0 PICKS UP LSB OF DATA WORD     200
         INI          1,1                                               210
         ENI          36,2                                              220
         ISK          **,3                                              230
         SLJ          DATALOOP                                          240
         LDA          NWREC                                             250
         INA          18                                                260
         ARS          2                                                 270
         SAU          CWREC                                             280
         STATUS       20                                                300
         QJP,MI       *-2                                               310
         QLS          1
         QJP,MI       *-3
         QLS          9
         QJP,MI       HALTEOT
         LIU          CWREC,1
         ENI          ,2
         ENI          1,3
         ENI          ,4
         ENI          1,5
         XMIT,AUG     LIST,WLIST
         WRITE        20,CWREC,*                                        290
         SLJ          TAPE                                              320
CWREC    IOTW         WLIST,**
WLIST    BSS          558
LIST     BSS          558                                               335
HALTEOT  WRITE        61,HALTMC,*
         RXT          P1,A
         STA          EOTSW
         SLJ          TAPE
HALTMC   IOTR         HALTM,4
HALTM    BCD          4, END OF TAPE MARK ENCOUNTERED
```

[redacted]

```
         END
         IDENT     FORMHDR SUBROUTINE
         ENTRY     FORMHDR
HEADERL  BLOCK
         COMMON    DRMSW,PRFCODE,SRSW
         COMMON    ARSRSW,ICSW,IFBSW
         COMMON    ARSTBSW,ACTPRF,TESTNMBR
         COMMON    TIMEBIN,FREQFXPT,RECCNT
         COMMON    DCSW,APRFF
IND REC  BLOCK
         COMMON    IHEADER(15),IDATA(2216)
FORMHDR  OCT       0
* DATA RECORDING MODE
         LDA       DRMSW
         ALS       6
* PRF
         ADD       PRFCODE
         STA       IHEADER
* SAMPLE RATE
         LDA       SRSW
         ALS       6
* APPROACH-RECEDE SAMPLE RATE
         ADD       ARSRSW
         STA       IHEADER+1
* INPUT CHANNELS
         LDA       ICSW
         ALS       6
* INPUT FILTER BANDWIDTH CODE
         ADD       IFBSW
         STA       IHEADER+2
* APPROACH-RECEDE STARTING BIN
         LDA       ARSTBSW
         STA       IHEADER+3
* ACTUAL PRF (TENS OF CYCLES)
         LDA       ACTPRF
         STA       IHEADER+4
```


[redacted]

```
*  TEST NUMBER (LEGEND)                350
          RXT       PZ,A               330
          STA       IHEADER+5          360
          STA       IHEADER+6          370
          STA       IHEADER+7          380
          RXT       PZ,Q               390
          EJECT                        400
*  FORM AND STORE TIME                 410
          LDA       TIMEBIN            420
          STA       US                 430
          RXT       PZ,Q
          STA       LOOK
          DVI       TEN                440
          STA       TS                 450
          RXT       PZ,Q
          STA       LOOK+1
          DVI       SIX                460
          STA       UM                 470
          RXT       PZ,Q
          STA       LOOK+2
          DVI       TEN                480
          STA       TM                 490
          RXT       PZ,Q
          STA       LOOK+3
          DVI       SIX                500
          STA       UH                 510
          RXT       PZ,Q
          STA       LOOK+4
          DVI       TEN                520
          STA       TH                 530
          RXT       PZ,Q
          STA       LOOK+5
          LDA       TS                 540
          MUI       TEN                550
          SUB       US                 560
          ROP,-     PZ,A,A             570
```

```
STA      US
LDA      UM
MUI      SIX
SUB      TS
ROP,-    PZ,A,A
STA      TS
LDA      TM
MUI      TEN
SUB      UM
ROP,-    PZ,A,A
STA      UM
LDA      UH
MUI      SIX
SUB      TM
ROP,-    PZ,A,A
STA      TM
LDA      TH
MUI      TEN
SUB      UH
ROP,-    PZ,A,A
STA      UH
LDA      TH
ALS      4
ADD      UH
ALS      4
ADD      UM
STA      IHEADER+8
LDA      TM
ALS      3
ADD      TS
ALS      4
ADD      US
STA      IHEADER+9
```

```
* FORM AND STORE FREQUENCY
        RXT     PZ,Q
        LDA     FREQFXPT
        STA     FRTEMP
        DVI     TENM
        STA     TENSM
        MUI     TENM
        ROP,-   PZ,A,A
        ADD     FRTEMP
        DVI     ONEM
        STA     ONESM
        MUI     ONEM
        ROP,-   PZ,A,A
        ADD     FRTEMP
        STA     FRTEMP
        DVI     HUNK
        STA     HUNSK
        MUI     HUNK
        ROP,-   PZ,A,A
        ADD     FRTEMP
        STA     FRTEMP
        DVI     TENK
        STA     TENSK
        MUI     TENK
        ROP,-   PZ,A,A
        ADD     FRTEMP
        DVI     FIVEK
        STA     FIVESK
        LDA     TENSM
        ALS     4
        ADD     ONESM
        STA     IHEADER+10
        LDA     HUNSK
        ALS     4
        ADD     TENSK
        ALS     1
```

```
         ADD      FIVESK                                       1280
         STA      IHEADER+11                                   1290
* RECORD COUNT                                                 1310
         LDA      RECCNT                                       1320
         STA      IHEADER+12                                   1330
* CYCLES AND FRACTIONAL PART OF PRF (ACTUAL)                   1340
         LDA      APRFF                                        1350
         STA      IHEADER+13                                   1360
* DIGITAL CANCELLER                                            1370
         LDA      DCSW                                         1380
         STA      IHEADER+14                                   1390
         SLJ      FORMHDR                                      1400
TEN      DEC      10                                           1420
SIX      OCT      6                                            1430
US       BSS      1                                            1440
TS       BSS      1                                            1450
UM       BSS      1                                            1460
TM       BSS      1                                            1470
UH       BSS      1                                            1480
TH       BSS      1                                            1485
FRTEMP   BSS      1                                            1490
TENM     DEC      10000000                                     1500
TENSM    BSS      1                                            1510
ONEM     DEC      1000000                                      1520
ONESM    BSS      1                                            1530
HUNK     DEC      100000                                       1540
HUNSK    BSS      1                                            1550
TENK     DEC      10000                                        1560
TENSK    BSS      1                                            1570
FIVEK    DEC      5000                                         1580
FIVESK   BSS      1                                            1590
LOOK     BSS      6
         END                                                   1600
```

APPENDIX II - TEST PROGRAM LISTING (U)

```
      PROGRAM TEST 95
      COMMON /DATA/ ICDC(7000)
      COMMON /IND REC/ LHEADER(15), LDATA(2216)
      COMMON /USE/ ISIZE, IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1  M, MSIZE, INITIME, MDROP, PRF, MRCVRWRD, LENHEADS, MSTART,
     2  NPRINT, NREC
      CALL TEST DATA
      DO 18 J=1,96
      DO 16 INT NO = 1, IPERREC
         DO 14 IBINNO = 1, IBINMAX
            DO 12 IBINWRD=1,NCPB
               L = IBINWRD + NCPB * IBINNO - NCPB + INTNO * IBINMAX
     1           * NCPB - IBINMAX * NCPB
               LDATA(L) = ICDC(M+LENHEADS)
               M=M+1
   12 CONTINUE
   14 CONTINUE
      M = M + MDROP * 3
               IF (M .GE. MSIZE ) M=1
   16 CONTINUE
C     PRINT FIRST 6 BINS OF EACH OUTPUT RECORD
                             PRINT 101, (LDATA(I), I=1,18)
  101 FORMAT (18(1X, I6))
   18 CONTINUE
      PRINT 102
  102 FORMAT(* START DUMP LAST RECORD*)
                             PRINT 101, (LDATA(K), K=1,2150)
      END
      SUBROUTINE TEST DATA
      COMMON /DATA/ IHD(4), ICDC(3,48,48)
      COMMON /USE/ ISIZE, IPERREC, INTCOUNT, IBINMAX, NCPB, IRCHECK,
     1  M, MSIZE, INITIME, MDROP, PRF, MRCVRWRD, LENHEADS, MSTART,
```

[redacted]

```
 2  NPRINT, NREC
 DO 1 INT=1,48
    DO 2 IBIN=1,48
       DO 3 ICH=1,3
          ICDC(ICH, IBIN, INT) = ICH + IBIN * 100 + INT * 10000
3 CONTINUE
2 CONTINUE
1 CONTINUE
  LENHEADS = 4
  IBINMAX = 42
  M = 1
  MSIZE = 6912
  IPER REC = 17
  NCPB = 3
  MDROP = 6
  NBIN = IBINMAX
  END
```


[redacted]